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Climate change — flood or drought?

11 August 2004

The Hadley Centre for Climate Prediction and Research at the Met Office has made a major step forward in climate prediction. They have developed a way of using complex climate models to generate probabilistic climate predictions which will enable decision makers and planners to better assess the risks of climate change and to develop appropriate response strategies.

Human activities have already started to change the world's climate and such changes will continue to grow. A key question is: how big will the changes be in the future? Different climate models give different predictions of the scale of global warming and substantially different predictions of regional climate change, particularly with respect to rainfall. At the global level these predictions help decision makers assess how much we will need to reduce greenhouse gas emissions to avoid "dangerous" climate change.

A useful measure of how responsive the global climate is to greenhouse gases is known as the "climate sensitivity" — defined as the global warming that would result from a doubling of CO₂ in the atmosphere. The Intergovernmental Panel for Climate Change (IPCC), which provides authoritative international assessments of scientific opinion on climate change, noted in their last assessment that "Climate sensitivity is likely to be in the range 1.5 to 4.5 °C". But this new work from the [Hadley Centre](#), published in the journal "Nature" today, reports a climate sensitivity in the range 2.4 to 5.4 °C. This result is the first of its kind, and although it starts with a limited set of climate simulations, it is already showing that the scale of climate change could be quite different from previous assumptions.

At the local and regional level climate predictions are essential for providing a basis for developing adaptation strategies to cope with climate change in sectors such as flood defence or water resource management. Due to the uncertainties in the predictions, the question is whether to play safe and incur a massive overspend by planning for the worst case scenario, or to invest minimum resources and risk the consequences. To factor these uncertainties into a proper risk assessment, probabilistic predictions of climate change are needed. The new research at the [Hadley Centre](#) is now enabling probabilistic predictions to be generated on a sound basis, whereas previously it has only been possible to look at the different results coming from models run at different institutions, without knowing which were more likely. James Murphy, who directs the research, says "Planners are faced with a wide range of futures, not knowing which to believe. Our work is aimed at providing them with a basis for making rational decisions about how much money to spend on adaptation".

Background

The new probabilistic predictions give the probability of different climate outcomes, based on the use of a comprehensive climate model. To achieve this, the [Hadley Centre](#) has made an ensemble of versions of its climate model by varying in a plausible way uncertain aspects of the model physics — for example by adjusting the relationship between relative humidity and cloud cover. Climate simulations from 53 model versions are combined to estimate the range of values for climate sensitivity noted above. It also provides the foundation for probabilistic regional predictions. The approach will now be further developed to take account of a wider range of modelling uncertainties, leading to improved estimates of uncertainties in global climate change and providing a basis for making probabilistic predictions for the all-important changes at a regional level.

The research was commissioned by [Defra](#) following the devastating [floods of October 2000](#).

[More about the Hadley Centre for Climate Prediction and Research](#)

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